

REMARKS

Claims 1-3, 5, 7-13, 15 and 17-27 are pending in this application. Claims 1, 9, 11, 12, 13, 18, 20, 21 and 24 have been amended. Claims 10 and 19 have been canceled without prejudice. It is respectfully submitted that no new matter has been added.

REJECTIONS UNDER 35 U.S.C. § 103:

Reconsideration is respectfully requested of the rejections of claims 1-3, 5, 7-9, 15, 17, 24-26 and 27 under 35 U.S.C. § 103(a) as being unpatentable over admitted prior art, Iyer (U.S. Patent No. 6,383,723) and Schulz (U.S. Patent No. 5,637,151).

Applicants respectfully submit that admitted prior art (“APA”), Iyer, and Schulz when taken alone or in combination, fail to teach or suggest “cleaning oxide residues from an anti-reflective layer using a second cleaning solution consisting essentially of SC1”, as recited in claims 1 and 24. Applicants respectfully submit that admitted prior art (“APA”), Iyer, and Schulz when taken alone or in combination, fail to teach or suggest “cleaning oxide residues from a hard mask layer using a second cleaning solution including SC1”, as recited in claim 9.

As acknowledged by the Examiner, APA and Iyer do not disclose or suggest the above claimed features.

The addition of Schulz does not render cleaning oxide residues from an anti-reflective layer using a second cleaning solution consisting essentially of SC1. In contrast, the disclosure in Schulz expressly teaches away from using a second cleaning solution consisting essentially of SC1 because Schulz discusses disadvantages associated with using a second cleaning solution consisting essentially of SC1. Rather, Schulz states

“the use of “SC1” tends to increase the metal contamination on the surface of the wafer”.
See, col. 1, lines 45-53 of Schulz. Instead, Schulz describes using a chemically modified SC1 to produce a different solution than SC1 for preventing the disadvantages perceived in using SC1.

Thus, one ordinary skill in the art looking to remove oxide residues from a semiconductor substrate would be discouraged or led away from using a claiming solution.

Claim 9 is allowable for at least the reasons set forth for claims 1 and 24. Further, Applicants respectfully submit that admitted prior art (“APA”), Iyer, and Schulz when taken alone or in combination, fail to teach or suggest “forming the hard mask layer comprising forming a first anti-reflective layer on the conductive film, forming an oxide film on the first anti-reflective layer, and forming a second anti-reflective layer on the oxide film”, as recited in claim 9.

The addition of Okoroanyanwu does not render hard mask layer comprising a first anti-reflective layer, an oxide film on the first anti-reflective layer, and a second anti-reflective layer on the oxide film.

Although Okoroanyanwu may describe an ARC layer (110) which comprises more than one layer, Okoroanyanwu does not disclose or suggest an oxide film formed between a first anti-reflective layer and a second anti-reflective layer. See, e.g., Fig. 6 and col. 9, lines 26-54.

Therefore, based on the foregoing, Applicants respectfully request that the Examiner withdraw the rejections of claims 1-3, 5, 7-9, 15, 17, 24-26 and 27 under 35

U.S.C. § 103(a) and that claims 1-3, 5, 7-9, 15, 17, 24-26 and 27 are in condition for allowance.

Reconsideration is respectfully requested of the rejections of claims 18, 22 and 23 under 35 U.S.C. § 103(a) as being unpatentable over Yang (U.S. Patent No. 6,159,860), Iyer and Schulz.

Applicants respectfully submit that Yang, Iyer, and Schulz when taken alone or in combination, fail to teach or suggest “cleaning oxide residues from a hard mask layer using a second cleaning solution including SC1”, as recited in claim 18.

As acknowledged by the Examiner, Yang and Iyer does not teach these features. Further, the addition of Schulz does not render the claimed features obvious for at least the same reasons provided above.

Therefore, claim 18 is patentable over the cited references. Claims 22 and 23 depend from claim 18. These dependent claims are believed to be patentable over Yang in view of Iyer and Schulz for at least the reason of their dependency on base claim 18.

Therefore, based on the foregoing, Applicants respectfully request that the Examiner withdraw the rejections of claims 18, 22 and 23 under 35 U.S.C. § 103(a) and that claims 18, 22 and 23 are in condition for allowance.

Reconsideration is respectfully requested of the rejections of claims 10-13 and 19-21 under 35 U.S.C. § 103(a) as being unpatentable over admitted prior art/Iyer/Schulz or Yang/Iyer/Schulz as applied to claims 9 and 18 above, and further in view of Okoroanyanwu (U.S. Patent No. 6,753,247).

Claims 10-13 depend from claim 9 and claims 19-21 depend from claim 18. Claims 11-13 and 20-21 are believed to be patentable over the combination of cited

references for at least the same reasons given above for respective base claims 9 and 18.

Claims 10 and 19 have been canceled.

Accordingly, reconsideration of the obviousness rejections is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 112:

Claims 1-3, 5, 7-13, 15, and 17-27 stand rejected under 35 U.S.C. § 112, first paragraph, for the reason set forth on page 6 of the Office Action.

The Examiner stated that “Applicant has not shown where in the specification teaching of the limitation ‘...oxide residues generated in forming the anti-reflective layer...’ and ‘...oxide residues generated in forming the hardmask layer....’”

The Examiner’s attention is respectfully directed to, for example, lines 1-10 on page 11 of the specification. The cited portion states that “oxides may be formed on the ARL 115 by a nitrogen oxide used as a purge gas for forming the ARL 115.”


The Examiner’s attention is respectfully directed to, for example, lines 4-8 on page 13 of the specification. The cited portion states that “to form a photoresist film on the second ARL 225, a purge process is performed in-situ forming the second ARL 225 using a purge gas including nitrogen oxide such as nitrous oxide. Oxide residues 230 are generated from the purge gas during the purge process and formed on the second ARL 225.”

Given the above teachings, one skilled in the art readily appreciates that oxide residues are generated in forming the anti-reflective layer as claimed.

Therefore, applicants respectfully request that the rejection under 35 U.S.C. § 112, first paragraph, be withdrawn.

An early and favorable reconsideration is earnestly solicited. If the Examiner has any further questions or comments, the Examiner may telephone Applicants' Attorney to reach a prompt disposition of this application.

Respectfully submitted,



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